on page 2, line 21 which is now page 3, line 1 after line 25 text has been added.

In claim 2 "the new" is replaced by "a new" on page 5 in line 11 which is now page 5, line 14 after line 25 text has been added.

In claim 3, "the new" is replaced by "a new" on page 6, line 2 which is now page 6, line 5 after line 25 text has beem added.

Comments

Thanks ever for your welcomed suggestions and guidelines.

Sincerely,

Contact No.	310.641.0488
E-mail	uavonderembse@ca.rr.com
Address	Urbain A. von der Embse
	7323 W. 85th St.
	Westchester, CA 90045-2444
Signature	Urbain A. von der Embse
Name	Urbain A. von der Embse

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/772,597	02/06/2004	Urbain Alfred von der Embse		5182

7590 07/30/2007

Urbain A. von der Embse
7323 W. 85th St.
Westchester, CA 90045-2444

EXAMINER	
BAKER, STEPHEN M	
ART UNIT	PAPER NUMBER
2112	

MAIL DATE	DELIVERY MODE
07/30/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.	Applicant(s)	
10/772,597	VON DER EMBSE, URBAIN ALFRED	
Examiner	**Art Unit**	
Stephen M. Baker	2112	

The MAILING DATE of this communication appears on the cover sheet with the correspondence address –

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 2 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 March 2007*.

2a)☐ This action is **FINAL**. 2b)☐ This action is non-final.

3)☒ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) _____ is/are rejected.

7)☒ Claim(s) *1-3* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. This application is in condition for allowance except for the following formal matters: Claims 1-3 are objected to because of the following informalities:

In claim 1: on page 2, line 9 (marked-up copy) "probsbility" apparently should be "probability"; on page 2 in line 23, "posterior" apparently should be "posteriori"; on page 2, line 25 is incomplete; on page 2, line 32, "the new" apparently is intended to be "a new".

In claim 2: on page 5, line 11, "the new" apparently should be "a new".

In claim 3: on page 6, line 2, "the new" apparently should be "a new".

Appropriate correction is required.

2. Prosecution on the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

A shortened statutory period for reply to this action is set to expire **TWO MONTHS** from the mailing date of this letter.

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen M. Baker whose telephone number is (571) 272-3814. The examiner can normally be reached on Monday-Friday (11:00 AM - 7:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jacques H. Louis-Jacques can be reached on (571) 272-6962. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Stephen M. Baker
Primary Examiner
Art Unit 2112

smb

APPLICATION NO. 10/772,597
INVENTION: Decisioning rules for turbo and convolutional decoding
INVENTORS: Urbain A. von der Embse

Currently amended CLAIMS

APPLICATION NO. 10/772,597

INVENTION: Decisioning rules for turbo and convolutional decoding

INVENTORS: Urbain A. von der Embse

CLAIMS

WHAT IS CLAIMED IS:

Claim **1.** (currently amended) A ~~means~~ method for ~~the~~ performing a new turbo decoding algorithm using a-posteriori probability $p(s,s'|y)$ in equations **(13)** ~~of the invention disclosure of the decoder trellis states s',s for the received codeword k-1,k conditioned on the received symbol set y = {y(1),y(2),. . .,y(k-1),y(k),. . .,y(N)}~~ for defining the maximum a-posteriori probability MAP, comprising: ~~in turbo decoding and which comprises~~:

using a new statistical definition of the MAP logarithm likelihood ratio $L(d(k)|y)$ in equations **(18)**

$$L(d(k))|y) = \ln[\ \Sigma_{(s,s'|d(k)=+1)}\ p(s,s'|y)] - \ln[\ \Sigma_{(s,s'|d(k)=-1)}\ p(s,s'|y)\ ]$$

equal to the natural logarithm of the ratio of the a-posteriori probability $p(s,s'|y)$ summed over all state transitions $s' \rightarrow s$ corresponding to the transmitted data $d(k)=1$ to the $p(s,s'|y)$ summed over all state transitions $s' \rightarrow s$ corresponding to the transmitted data $d(k)=0$,

using a factorization of the a-posteriori probability $p(s,s'|y)$ in equations (13) into the product of the a-posteriori probabilities ~~$p(s'|y(j<k)),p(s|s',y(k)),\ p(s|y(j>k))$~~

$$p(s,s'|y)=p(s|s',y(k))p(s|y(j>k))p(s'|y(j<k)),$$

using a turbo decoding forward recursion equation ~~for evaluating said a-posteriori probability p(s'|y(j<k)) using said p(s|s',y(k)) as the state transition a-posteriori probability of the trellis~~

$$p(s|y(j<k),y(k)) = \sum_{\text{all } s'} p(s|s',y(k))\ p(s'|y(j<k))$$

for evaluating said a-posteriori probability $p(s'|y(j<k))$ in equations (14) using $p(s|s',y(k))$ as the state transition a-posteriori probability of the trellis transition path $s' \rightarrow s$ to the new state s at k from the previous state s' at k-1 and given the observed symbol y(k) to update these recursions for the assumed value of the user data bits d(k) equivalent to the transmitted symbol x(k) which is the modulated symbol corresponding to d(k),

using a turbo decoding backward recursion equation ~~for evaluating said a-posterior probability p(s|y(j>k)) using said p(s'|s,y(k)) as the state transition a-posteriori~~

$$p(s'|y(j>k-1)) = \sum_{\text{all } s} p(s|y(j>k))p(s'|s,y(k))$$

for evaluating the a-posteriori probability $p(s|y(j>k))$ in equations (15) using said $p(s'|s,y(k)) = p(s|s',y(k))$ as the state transition a-posteriori probability of the trellis transition path $s \rightarrow s'$ to the new state s' at k-1 from the previous state s at k and given said observed symbol y(k) to update these recursions for said assumed value of d(k), ~~equivalent to said transmitted symbol x(k) which is the modulated symbol corresponding to said d(k) and where said $p(s'|s,y(k)) = p(s|s',y(k))$,~~

evaluating the natural logarithm of the state transition a-posteriori probability $p(s|s',y(k)) = p(s'|s,y(k))$ ~~as a function which is linear in the received symbol~~

~~y(k)~~equal to ~~the~~a new decisioning metric DX in equations (11),(16), defined by equation

$$\ln[p(s|s',y(k)) = \ln[p(s'|s,y(k))]$$
$$= \mathrm{Re}[y(k)x^*(k)]/\sigma^2 - |x(k)|^2/2\sigma^2 + p(d(k))$$
$$= DX$$

~~and~~ wherein p is the natural logarithm ln of p, x* is the compelex conjugate of x, and ln[o] is the natural logarithm of [o],

~~evaluating said natural logarithm of said state transition a-posteriori probability p(s'|s,y(k))=p(s|s',y(k)) equal to the new decisioning metric DX in equations (11),(16)~~

~~$$\ln[p(s|s',y(k))] = \ln[p(s'|s,y(k))]$$
$$= \mathrm{Re}[y(k)x^*(k)]/\sigma^2 + |x(k)|^2/2\sigma^2 + p(d(k))$$
$$= DX$$~~

~~and which is linear in said received symbol y(k),~~

whereby said new state transition probabilities in said MAP equations use said DX linear in y(k) in place of the current use of the maximum likelihood decisioning metric $DM=[\ -|y(k) - x(k)|^2/2\sigma^2\ ]$ which is a quadratic function of y(k),

~~$$DM = [\ -|y(k) - x(k)|^2/2\sigma^2\ ],$$~~

~~which is a quadratic function of y(k),~~

whereby said MAP turbo decoding algorithms ~~realizes~~ provide some ~~of~~ the performance improvements demonstrated in FIG. **5,6** using said DX, and~~,~~

~~said~~ whereby this new a-posteriori mathematical framework enables said MAP turbo decoding algorithms to be restructured and to determine the intrinsic information as a function of

said DX linear in said y(k).

Claim 2. (currently amended) ~~Wherein in claim 1 a~~A method for performing ~~means for said~~ a new convolutional decoding algorithm ~~in said~~using the MAP a-posteriori probability $p(s,s'|y)$ ~~and which comprises~~in equations (13), comprising:

using a new maximum a-posteriori principle which maximizes the a-posteriori probability $p(x|y)$ of the transmitted symbol x given the received symbol y to replace the current maximum likelihood principle which maximizes the likelihood probability $p(y|x)$ of y given x for deriving the forward and the backward recursive equations to implement convolutional decoding,

using ~~said~~ the factorization of ~~said~~ the a-posteriori probability ~~$p(s,s'|y)$~~ in equations (13) into the product of said a-posteriori probabilities $p(s'|y(j<k))$, $p(s|s',y(k))$, $p(s|y(j>k))$ to identify the convolutional decoding forward state metric $a_{k-1}(s')$, backward state metric $b_k(s)$, and state transition metric $p_k(s|s')$ as the a-posteriori probability factors

$$p_k(s|s') = p(s|s',y(k))$$
$$b_k(s) = p(s|y(j>k))$$
$$a_{k-1}(s') = p(s'|y(j<k)),$$

using a convolutional decoding forward recursion equation in equations (14) for evaluating said a-posteriori probability $a_k(s)=p(s|y(j<k),y(k))$ using said $p_k(s|s')=p(s|s',y(k))$ as said state transition probability of the trellis transition path $s' \rightarrow s$ to the new state s at k from the previous state s' at k-1,

using a convolutional decoding backward recursion equation in

equations (15) for evaluating said a-posteriori probability $b_k(s)=p(s|y(j>k))$ using said $p_k(s'|s)=p(s'|s,y(k))$ as said state transition probability of the trellis transition path $s \rightarrow s'$ to the new state s' at k-1 from the previous state s at k,

evaluating the natural logarithm of said state transition a-posteriori probabilities

$$\ln[p_k(s'|s)] = \ln[p(s'|s,y(k))]$$
$$= \ln[p(s|s',y(k))]$$
$$= \ln[p_k(s|s')]$$
$$= DX$$

equal to ~~said the~~ a new decisioning metric DX in equations (16), and~~,~~

implementing said convolutional decoding algorithms to ~~realize~~obtain some of the performance improvements demonstrated in FIG. **5,6** using said DX.

Claim **3.** (currently amended) Wherein in claim ~~**1**~~**2** ~~A means for~~a method for implementing the new convolutional decoding recursive equations, ~~which calculate said MAP a-posteriori probability $p(s,s'|y)$~~ said method comprising:~~and which comprises:~~

~~said~~ implementing in equations (14) a forward recursion equation for evaluating ~~said~~the natural logarithm~~,~~ a_k, of a_k using ~~said $p_k=\ln[p(s|s',y(k))]$ as~~ the natural logarithm ~~said~~ of the state transition a-posteriori probability $p_k=\ln[p(s|s',y(k))]$ of the trellis transition path $s' \rightarrow s$ to the new state s at k from the previous state s' at k-1, which is equation ~~and is~~

$$a_k(s) = \max_{s'} [a_{k-1}(s') + p_k(s|s')]$$

$$= \max_{s'} [\underline{a}_{k-1}(s') + DX(s|s')]$$

$$= \max_{s'} [\underline{a}_{k-1}(s') + Re[y(k)x^*(k)]/\sigma^2 - |x(k)|^2/2\sigma^2 + \underline{p}(d(k))]$$

wherein said $DX(s|s')=\underline{p}_k(s|s')]=\underline{p}_k(s'|s)=DX(s'|s)=DX$ is ~~said~~ ~~thea~~ new decisioning metric, and

~~said~~ implementing in equations (15) a backward recursion equation for evaluating ~~said~~ the natural logarithm, $\underline{b}_k$. of $\underline{b}_k$ using ~~said $\underline{p}_k=\ln[p(s'|s,y(k))]=\ln[p(s|s',y(k))]$ as~~ the natural logarithm of said state transition a-posteriori probability $\underline{p}_k=\ln[p(s'|s,y(k))]=\ln[p(s|s',y(k))]$ of the trellis transition path $s \rightarrow s'$ to the new state s' at k-1 and is equation

$$\underline{b}_{k-1}(s') = \max_{s} [\underline{b}_k(s) + DX(s'|s)].$$ ~~and,~~

~~said decoding algorithms realize some of the performanceimprovements demonstrated in FIG. 5,6 using said DX.~~

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INVENTION: Decisioning rules for turbo and convolutional decoding
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Clean version of how the CLAIMS will read